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THE HUNTERIAN ORATION 1901.

N. C. MACNAMARA

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THE

HUNTERIAN ORATION

FEB. 14, 1901

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THE

HUNTERIAN ORATION

DELIVERED ON THURSDAY, FEBRUARY 14, 1901

AT THE

Royal College of Surgeons of England

BY

N. C. MACNAMARA

FELLOW OF THE ROYAL COLLEGE OF SURGEONS OF ENGLAND
AND ALSO OF THE R.C.S. OF IRELAND
FELLOW OF THE CALCUTTA UNIVERSITY

LONDON
SMITH, ELDER, & CO., 15 WATERLOO PLACE
1901

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THE chart accompanying the text of this oration was compiled from photographs of casts and of skulls in the Museum of the Royal College of Surgeons of England. These photographs, with four exceptions, were taken by Mr. George in the photographic room on the College premises, by kind permission of Prof. C. Stewart. The four exceptions include three photographs from skulls in the Thurnam collection, forming a part of the Anatomical Museum of the University of Cambridge, for which I have to thank Dr. J. Griffiths; and the fourth is a photograph of one of the Mentone skulls, for which I am indebted to A. J. Binny, Esq. The other specimens shown on the chart were on the table and were referred to during the oration. The portrait of John Hunter hanging on the wall of the Theatre belongs to the College, and was painted in the year 1785 by Sir Joshua Reynolds.

The oration is published at the request of the Council of the College.

N. C. MACNAMARA.

13 Grosvenor Street, W.:
March 1901.

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THE

HUNTERIAN ORATION

We meet to-day shadowed by a dark cloud of sorrow. The death of our revered Queen has elicited from people inhabiting every part of the globe deep expressions of heartfelt grief, for she was, in a sense never before realised by a monarch, a friend of all her people. Her wisdom and patriotism were such that in her hands we all felt the honour and best interests of our country were secure. She was at the same time, in the midst of all her cares and responsibilities, tender and deeply sympathetic with those in trouble or sickness. The Queen took a keen interest in all that concerned the progress of our profession, and quite recently, in spite of failing bodily strength, visited the wards of Prince Albert's Military Hospital at Netley on more than one occasion, in order to testify to her sick and wounded soldiers how deeply she appreciated their services. The memory of Queen Victoria is held in loving reverence by us all, and we believe that the force of her example will live and influence for good many generations of English men and women.

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In this season of universal mourning we have the consolation of knowing that our King, by his never failing courtesy and unselfish attention to the numerous calls made upon him by the nation, has already endeared himself to his subjects. His Majesty has on several occasions shown his personal appreciation of the work carried on in our College, and is, indeed, one of our Honorary Fellows. We hope that, in spite of the multifarious duties entailed on him by the exalted position to which he has been called, he may still find time to continue his interest in this Institution, and in the Fund he has established with the object of placing our Metropolitan Hospitals in a satisfactory financial position. We render him our most sincere thanks for all he has done for us, and pray that, under God's protection, he may long be spared to rule over this country and empire.

Since the last Hunterian oration was delivered in this Theatre we have had to deplore the death of one of our former Presidents, Sir James Paget, who for many years was so intimately connected with the work of our College, that it is only natural his memory should to-day occupy a prominent place in our minds. It is hardly possible to express the sentiments we hold regarding Sir James Paget in more appropriate language han those contained in the following resolution, which was forwarded to his family on December 30, 1899, by the Council of the College:

'The Council gratefully remember the many services rendered to the Royal College of Surgeons by Sir

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James Paget during his long association with it, and they desire to record their appreciation not only of his eminence as a surgeon, his ability as a teacher, and his grace and eloquence as a speaker, but also of his admirable personal character, which won for him the warm regard of all who knew him.

'The Council believe that no member of the surgical profession more fully enjoyed the confidence and esteem of his colleagues, and they are assured that his loss will long be felt, and that his name will ever be placed in the foremost rank of those who have done good in their time and brought honour to their profession.'

GENTLEMEN,—We have assembled here to-day in order that we may commemorate the merits of John Hunter and such other persons whose labours have contributed to the extension of our knowledge in comparative anatomy, physiology, or surgery. Hunter's life, in all its various aspects, has been so frequently dwelt on in former orations delivered in this Theatre, that it is beyond my power to throw any fresh light on this subject. His fame is attributable to his having possessed an intense love of science, indomitable energy, and a self-reliant, manly character. If we turn to his portrait, hanging on the walls of this Theatre, it would seem that, at the time this likeness was painted, Hunter was engaged in the study of the craniology of man and anthropoid apes, for on the table before him there is an open volume, and on its pages we see clearly drawn a human skull and the skull of a chimpanzee. Hunter

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is portrayed, pen in hand, in deep thought, having just turned away from the book he had been studying; and though his notes on comparative anatomy were unfortunately destroyed with his other manuscripts, we can hardly doubt that craniology was a subject in which he was deeply interested, or it would not have held so prominent a position in this famous picture. It would therefore seem that on an occasion such as the present we can do no higher honour to Hunter's memory, and to that of some of the able men of science who have followed him, than by endeavouring to give, in as few words as possible, a *résumé* of their labours, with especial reference to the subject of craniology and the light which it is capable of throwing on the prehistoric inhabitants of Western Europe, and of the evolution of the race of men to which we belong. One of the most brilliant and original thinkers who have occupied the Presidential Chair of this College, Sir William Lawrence, in his ever memorable lectures on the natural history of man, delivered in this College in the year 1819, from his researches in comparative anatomy foreshadowed the idea that man and apes were derived from common ancestors. Lawrence's opinions were received with a storm of adverse criticism. Mr. Abernethy, for instance, charged him with 'propagating opinions detrimental to society, and endeavouring to enforce them for the purpose of loosening those restraints on which the welfare of mankind depend.' Time, however, has proved that Lawrence was right, and in the course of lectures delivered in this Theatre in February 1899, Professor

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Keith, from a careful analysis of the maximum number of anatomical characters common to man and apes, arrived at the conclusion that they are derived from an identical or a kindred stock. While admitting without reserve that man and apes are structurally almost identical, nevertheless, as pointed out by Professor Huxley in the year 1863, they differ very materially as regards the relative size and weight of their brains, as well as in the complexity of its convolutions. The carcase of a full-grown gorilla is heavier than that of an average-sized European, but it is doubtful whether a healthy adult European's brain ever weighed less than thirty-two ounces, or the brain of the heaviest gorilla ever exceeded twenty ounces in weight.[1] Although at the present time there is this marked relative difference between the weight of the brain and the form of the skulls of Europeans and apes, this was not always the case, for the calvaria of the earliest discovered human beings were in form not very far removed from those of contemporary anthropoid apes. This fact leads us to inquire into the nature of the conditions which have led to the increased capacity of the human cranium, and to the vast superiority of man's intellectual endowments over those of all the other primates. If we turn to Hunter's preparations in our Museum[2] we find among them some remarkable specimens, which he describes as 'compressed,' 'unsymmetrical' human crania, which he believed were the result of premature consolidation

[1] *Man's Place in Nature*, by Professor T. Huxley, p. 103.
[2] College Catalogue, Nos. 135, 137 and 139.

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of one or more of the sutures of the skull. Professor Virchow states that 'in the too early ossification of a suture of the skull, the development of the cranium is arrested in the diameter perpendicular to that centre.' Since Hunter's day various authorities have devoted much time to the subject of the abnormal closure of the cranial sutures in man. Prominent among them are the names of the chief of England's craniologists, Drs. Thurnam, Beddoe, and Barnard Davis (the splendid collection of prehistoric and other skulls made by the latter gentleman is now in the possession of our College), and we have come to learn that the size and shape of the skull depend, to a large extent, on the growth of the bones of which it is formed along the lines of the various cranial sutures, a subject to which I have referred at some length in my book on 'The Origin and Character of the British People.'

It is well known that the frontal bone, which forms the vault of the anterior part of the cranium in the young of man and apes, is divided by a suture, and so long as this line of growth, together with the coronal and other sutures by which the frontal is separated from surrounding bones, remains open, the fore part of the skull, and with it the anterior fossæ which it encloses, can expand. But if the frontal and the other anterior sutures of the cranium consolidate early in life the fore part of the skull cannot increase in capacity beyond the size it had reached in infancy. Professor Deneker[3] in his work on the embryology and development of

[3] *Archives de Zoologie expérimentale et générale*, tome troisième, année 1885.

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anthropoid apes has shown that in consequence of the early closure of the anterior sutures of the skull of these animals, the fore part of their brain does not increase beyond the size it had attained at the end of the first year of life; but in man these sutures do not consolidate until a much later period, so that the anterior lobes of his brain are enabled to expand, and actually become far more perfectly developed than the corresponding lobes among anthropoid apes.

Among these apes in consequence of the great size of their frontal sinuses and the roofs of the orbits rising more obliquely into the cranial cavity, the anterior and the inferior walls of the anterior fossæ of their skulls intrude upon and lessen the capacity of this space, and therefore of the anterior lobes of the brain which are contained in these fossæ.[4] Virchow states that 'of all parts of the ape's head, it is the brain that grows least;' even 'the largest ape keeps its baby-brain.' Although we have not sufficient data to fix the absolute duration of the life of anthropoid apes, it is doubtful if they, as a rule, attain the age at which man arrives at his full growth. It is, however, certain that the largest apes are perfectly developed when man is still in his youth, and that the ape's brain has reached perfection before the period of shedding its teeth, while in man it then takes its real first step to perfection, men of the same bulk as these apes having four times as much superficial brain surface.[5]

[4] See Professor D. J. Cunningham's work on *Surface Anatomy of Cerebral Hemispheres*, p. 286.

[5] *The Cranial Affinities of Man and Apes*, by Professor R. Virchow, p. 26. Also *Journal of Anat. and Phys.* new series, vol. xiii. p. 275.

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Whatever other functions the anterior lobes of the brain perform, the specific structure of their cortical nerve elements, in conjunction with those of the other lobes of the brain, controls our associative memory and our higher intellectual faculties. If we study the collection of preparations of the brains of apes in our Museum, we must arrive at a similar conclusion to that expressed by Professors Edinger and D. J. Cunningham, which is that the gyri (or convolutions) of the brain of man and of the anthropoid apes are to a large extent similar in anatomical characters, with the marked exception of those convolutions which enter into the formation of the frontal lobes. The superior and the middle gyri of these lobes in anthropoid apes are always much shorter than they are in the brains of average Europeans, and what is of especial importance in the brains of anthropoid apes, the inferior frontal gyri exist only in a rudimentary condition of development. This deficiency is very marked with respect to that area of the left inferior gyrus which contains the nerve elements which control our faculty of articulate language. It seems probable that the rudimentary condition of this gyrus in apes is therefore the anatomical expression of the inferiority of these animals to man in intelligence; our intellectual development depending mainly on our possessing the faculty of speech.[6] It may be, anthro-

[6] *The Anatomy of the Central Nervous System of Man*, Professor Ludwig Edinger, M.D., translated from the fifth German edition by Professor W. S. Hall, 1889, pp. 194, 210. Edinger remarks that 'very gradually the mantle of the embryonic brain increases in extent, ascending in the vertebrate series. In the apes belonging to the class of primates it has attained an expansion which borders closely on the relations found

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poid apes having only rudimentary, if any, specialised areas of the cortical nerve elements which regulate the apparatus necessary for the production of articulate speech, that the other parts of their anterior lobes have remained in a comparatively undeveloped condition; whereas the left inferior frontal lobe of man's brain having become highly specialised, and with it his power of language, the other convolutions of his anterior lobes which govern his intellectual faculties have been stimulated to increased action, and in this way the characteristic expansion of the fore-brain has been evolved among all the more highly civilised races of the human family.

But our contention is that the factors which govern the growth of the skull differ from those which develop the brain, and that the imperfect evolution of the frontal lobes among anthropoid apes is to a large extent due to the premature ossification of that part of the skull which encloses the fore-brain; and to the

in man. Nevertheless, an important factor, besides more unessential relations, still separates it from the stage reached by man. The frontal lobe, still very small in the lower apes, attains a large size in the higher apes, but always remains much inferior to that of man. In man, even, this developmental process is nowise terminated as yet. Differences still plainly occur in the region of the frontal lobe which allow us to infer the possibility of further perfecting. The inferior region of the frontal lobe, which contains the centres of articulate speech, and shows very marked variations in development, is the part more particularly concerned.'

Professor D. J. Cunningham states that 'one of the most remarkable characters of the cerebrum of the chimpanzee and orang is the total absence of the frontal and orbital opercula,' or the pars triangularis, which contains Broca's nerve centre for articulate speech. Contributions to the *Surface Anatomy of the Cerebral Hemispheres*, by Professor D. J. Cunningham, Dublin, 1892, pp. 110, 279, 305, where he states that 'the inferior frontal convolution of the ape is very different from that of man.'

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remarkable convexity of the orbital plates of the frontal bone. However this may be, the possession of fully-developed anterior lobes of the brain, especially of its left inferior gyrus, is the distinctive character of the central nervous system of all those families of mankind who possess well-developed intellectual capacities. On the other hand, if we compare the skull of an Englishman (with a cranial capacity of 1575) with that of one of the natives of Northern Australia (with a cranial capacity of 1160), we see what a wide difference there is between the development of their frontal regions, and also as to the nature of the sutures of their skulls.[7]

[7] Professor Huxley held that the organisation of the human brain had more to do with man's intellectual superiority than either its weight or size, and there can be no question that men having small heads are by no means necessarily wanting in mental capacity; but a well-developed frontal region is a characteristic feature of all the more highly civilised communities of the world, and among such people low intellectual endowments or even idiocy is found to be comparatively frequent in those with abnormally small frontal lobes (see note p. 103, *Man's Place in Nature*). We agree fully with Professor Huxley that among all the known races of human beings the brain and its including case, the skull, grow together, and the former does not exercise an absolutely predominating influence over the development of the latter. But it is certain that if the anterior part of the skull becomes a 'shut-box' early in life, it must control the subsequent size and development of the brain which it contains. Professor Welcker, who studied this subject in a thorough Teutonic spirit, arrived at the conclusion that in European races the frontal suture remains open up to the adult period of life in one out of nine persons. Among African races it is not found open at the adult period of life in more than one in one hundred and fifty persons; and among the aborigines of Australia no adult skull has yet been observed with an open frontal suture. The well-known French anatomist Gratiolet states as a result of his researches that 'not only the growth of the brain ceases sooner in those races in which the sutures close early, but also that there is a difference between the higher and lower races as to the order in which the sutures are closed normally. In the latter the anterior sutures consolidate before the posterior, and in the higher races it is the reverse; the posterior sutures close earlier than the anterior.' M. Gratiolet bases an argument for the greater perfectibility of the higher races upon

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(This point is clearly illustrated in the photographs taken from the skulls of 'existing races of men,' as shown in the lower section of the chart which accompanies this oration.) We shall discover from specimens in our Museum that the inhabitants of Western Europe in the later tertiary and early quaternary period, as regards the ossification and form, especially of the frontal region of their skulls, more closely resembled that of the chimpanzee than the race of men now inhabiting Europe.[8]

Since Hunter's and Lawrence's time considerable progress has been made in the sciences of geology and anthropology. Nevertheless, in our search for knowledge concerning the origin and development of prehistoric man in Western Europe, we are still hampered by the limited supply of his remains. It could hardly have been otherwise, considering the perishable nature of the human skeleton, and the vast length of time and the great geological changes which have occurred since man appeared in our part of the world. But we have additional evidence concerning the prehistoric inhabitants of this part of Europe, for they have left us some of their imperishable handiwork in the shape of flint

these facts. On the other hand, Professor L. Edinger is disposed to agree with the late Professor Perls, that not a few men of pre-eminent intellectual power have in early life been affected with slight hydrocephalus, which, having abnormally expanded their skulls, has then receded. The brain of such young people has been able to attain a greater capacity than it would have acquired had there been no hydrocephalus to expand the skull cap. (*The Anatomy of the Central Nervous System of Man*, by L. Edinger, M.D., translated from fifth German edition by Professor W. S. Hall, p. 206.)

[8] *The Origin and Character of the British People*, by N. C. Macnamara, p. 25.

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and stone implements, which during the past century have been carefully studied in relation to the geological strata in which they were discovered, by Lord Avebury, Professors Boyd Dawkins and Prestwich, Sir John Evans, the late Sir William Flower,[9] together with many other English and foreign anthropologists. A few characteristic specimens of these Palæolithic flint instruments which have been unearthed in pre-glacial and in inter-glacial formations in various parts of England may be seen on the shelves of our Museum, which also holds casts and the skulls of the Neanderthal group of men. From the form and workmanship of these stone implements we are now able to classify and assign them to the various periods in which they were manufactured by the early inhabitants of our part of the world.

Up to within recent times it was held that no human beings existed on the earth before the quaternary geological epoch. But in the year 1867 the Abbé Burgeois exhibited a collection of chipped flint weapons which he had discovered in a previously undisturbed tertiary formation; it was not, however, until 1872 that these instruments were admitted to have been made by

[9] Sir William Henry Flower, K.C.B., F.R.S., died on July 1, 1899. He was for some years the Conservator of the Museum of the Royal College of Surgeons of England, and the Council of the College unanimously passed the following resolution at their meeting on July 13, 1899:

'The Council hereby express their deep regret at the death of Sir William Henry Flower, K.C.B., F.R.S., and their sincere sympathy with Lady Flower and the members of his family. The Council remember how much Sir William Flower, while Conservator, did to advance the utility and reputation of the Museum by the skilful discharge of his duties, and by the eminent position which he won for himself among men of science, and they hereby record their grateful appreciation of his services to the College.'

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man or some other animal living previously to the commencement of the quaternary period. Precisely similar flint weapons have since been discovered in tertiary strata in various localities in Europe, and in Asia.

In the year 1894 Dr. Eugène Dubois found the upper part of a human skull (calvaria) in close proximity to a femur, and two molar teeth in a well-defined tertiary geological formation in the Island of Java. Dr. Dubois was employed by the Dutch Government to examine and report on the fossil-bearing strata of Java, and while engaged on this work he discovered imbedded in a hard mass of tertiary tuffs the bones above referred to. He brought these fossils to Europe and submitted them for examination to the leading anatomists of this and other countries. They concurred in the opinion that the femur was a human bone belonging to a man of a very low type; and which showed 'that while it rendered its possessor capable of the bipedal mode of locomotion, he still retained some vestiges of adaptation to an arboreal existence.'[10] There was a difference of opinion concerning the calvaria, for it was calculated the capacity of this skull did not exceed 850 c.c. The cranial capacity of the largest anthropoid ape is 600 c.c. Until the Java skull was found the earliest known human skulls had cranial capacities of about 1220 c.c. After a complete and exhaustive analysis of the anatomical characters of the Java calvaria, as compared with the skulls of man and apes, Professor Schwalbe has arrived at the conclusion, in which I fully concur, that the Java skull, taking both its form and capacity into consideration, 'is on

[10] *Journal of Anat. and Phys.*, new series, vol. xiii. p. 273.

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the border line between that of man and anthropoid apes'; it is more closely allied to the skulls of the Neanderthal group of men than it is to the crania of the higher apes; but it is much nearer in anatomical characters to the skull of the chimpanzee than it is to the cranium of the average adult European of the present day.[11] Nevertheless, from a study of the impressions of the convolutions of the brain on the interior of the Java calvaria, Dr. Dubois has demonstrated that the inferior gyri of the frontal lobes are well marked, and approach in form those of man; and although the superficies of this convolution of the brain in the Java skull is less than half the dimensions of that of Europeans of the present day, it is double that possessed by the largest known anthropoid ape. This fact suggests that the Java man had in some slight degree the faculty of speech, and that his intellectual capacity was higher than that of any anthropoid ape we are acquainted with.[12] The post-orbital index, or narrowing of the Java calvaria, is 19·3 as compared with an average index of existing Europeans of 12. In this respect the Java skull comes nearer to the Neanderthal group than it does to that of anthropoid apes; it also possesses indications of the existence of that characteristically human feature, frontal eminences.

In the employing of skulls, which we believe to be the most reliable test of human races, we classify them

[11] *Zeitschrift für Morphologie und Anthropologie.* Professor Dr. G. Schwalbe, Universität Strassburge. Band I. Heft 1, 1899, p. 226.

[12] 'The Brain-cast of Pithecampus Erectus,' by E. Dubois, *Journal of Anat. and Phys.*, new series, vol. xiii.

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under three heads, according to the measurements of their cranial indices. In other words, the measurement of the greatest breadth of the cranium expressed in percentage of its greatest length is our guide as to the race to which an individual belongs from a craniological point of view. When the cranial index rises above 80, the head is called brachycephalic, a broad head; when it falls below 75 the term dolichocephalic or long head is applied to it. Indices between 75 and 80 are characterised as mesocephalic, intermediate heads. Assuming the length of the cranium to be 100, the width is expressed as a fraction of it, and is known in the living subject as being the cephalic, and in the bare skull as the cranial index. For instance, if the greatest breadth of a skull is 152 m.m. and its length is 190 m.m., we multiply the breadth, 152, by 100, and divide the product by its length, 190, which gives us the cephalic index 80.

We have in our Museum casts of two crania and other bones, forming part of human skeletons which were found resting on a ridge of calcareous rock overlooking the river Orneau, in the commune of Spy, Belgium. These remains were unearthed with great care, and there is every reason to believe they were originally deposited where they were discovered, being covered over with four well-defined beds of *débris* and clay, in which were found the bones of the rhinoceros and the mammoth, also flint weapons of the Mousterian epoch.[13] One of these skulls has characters which

[13] The most superficial layer was 9·5 metres thick, and was formed by *débris* which had fallen from the rock above. The second layer was

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resemble those of the higher apes, and assimilate still more nearly to the Java skull, indicating the low type of human being of which this cranium formed a part. Its form, like that of the other human inhabitants of Europe as yet discovered in the early geological strata of the pre-glacial or the inter-glacial period, is of the long or dolichocephalic type, its sutures are simple, and for the most part are consolidated. We have another cast, presented to our Museum by Professor Huxley, one of our most talented and earnest workers in the science of anthropology, taken from the Neanderthal cranium. This cranium, with other portions of a Palæolithic human skeleton, was found in a limestone cave near Düsseldorf.[14] The cave was raised some sixty feet above the existing bed of the river Düssel, and its floor was covered to a depth of five feet by fluviatile deposits, beneath which these human remains were discovered. The frontal angle of the Neanderthal and Spy skull (No. 1) is 64°, that of the Java skull is 50°, whereas the existing races of adult male Europeans have a frontal angle of about 90°; in this group of skulls, although still but slight, the indications of frontal

8 metres thick, and formed of yellow argillaceous tuffs. The third layer was 6 metres thick, consisting of red clay, in which were numerous Mousterian flints and the tusk of a mammoth. The fourth was yellow calcareous clay, immediately beneath which the human remains with bones of extinct animals were found.

[14] The term Palæolithic is applied to geological formations distinguished by containing the rudest shapes of human stone implements associated with the remains of mammals, some of which are entirely extinct, while others have disappeared from the districts where their remains have been found. These deposits may be classed under the heads of alluvium, brick-earth, cavern-beds, calcareous tufas, and loess. (*Class Book of Geology*, Sir A. Geikie, p. 361.)

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eminences are perhaps more distinct than is the case in the Java skull. The skull capacity of the Neanderthal group of human beings amounts to 1220 c.c., the Java skull to 850 c.c., whereas Europeans of the present day have an average cranial capacity of 1540 c.c. to 1600 c.c.

We have in our collection also a skull of the characteristic early Palæolithic type, presented to the College by one of our former Presidents whose memory is treasured by all who knew him, Professor George Busk: it was found in a layer of brecciated talus, under the north front of the Rock of Gibraltar. We have also a cast of the calvaria of one of this race found in county Sligo. Another skull of the same type was discovered at Bury St. Edmunds, with the remains of extinct animals and Mousterian flint weapons.[15]

The anterior surface of the lower jaw among the existing races of Europe projects to form the chin. Among apes the reverse is the case, for the anterior surface of their mandibles recedes. The Malarnaud and the Naulette mandibles, of which we have casts, are evidently those of human beings: they were found in geological formations (which also contained the bones of extinct species of animals, and Palæolithic flint weapons). These bones are distinctly ape-like in character, having receding anterior surfaces, and also the sockets of all the molars are equal in size. The bones of the legs of these pre-glacial or inter-glacial inhabit-

[15] We possess accurate drawings and a description of this cranium There can be no question that this was a genuine Palæolithic skull, and demonstrated the presence in the county of Suffolk of this race of human beings when England was still connected by land with France.

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ants of Europe are of ape-like form, and, together with the bones of their arms, prove that they were a short powerful race of beings whose average stature did not exceed five feet. They are known as the Neanderthal group of men. The side view of the skulls and that from above of four of the men in this group are illustrated in our chart.

It should be clearly understood that, up to the present time, no *bonâ fide* human remains belonging to the early Palæolithic period have been discovered in Western Europe which were not of the same type as those above described.

When the glaciers which had extended over the greater part of Europe moved northward, the reindeer passed away with them from our part of the continent. These animals, which could be easily captured by man, had roamed in vast herds over the surface of the country, and had probably afforded the human inhabitants of that period, living in Western Europe, an ample supply of food. The climate of our part of the world at the termination of the glacial period became such as we now experience. Britain was separated from France by sea, and fine rivers containing numerous fish filled the valleys of our land; the red deer, wild horse and various fleet-footed animals abounded in the splendid forests which overspread the country. But these animals and the fish of our lakes and rivers were not easily captured, and the human inhabitants of Western Europe were therefore compelled to exert their intellectual capacities to an extent not heretofore necessary, in order to supply themselves with food and with the

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skins of animals for clothing. Man was able to overcome the difficulties he had to face, possessing an innate power by means of which (as already explained) his brain was able to develop and so meet the increased demand made upon it in the struggle for existence. That such was the case we judge from the discovery, in geological formations of the post-glacial period, of the skulls of men having the same physical type as those of the strictly early Palæolithic epoch of Western Europe, but with increased brain capacity. These post-glacial human skulls indicate, in *my* opinion, a gradual transition in form from the ape-like characters of the previous period to a higher standard, and certainly to a much greater skull capacity, especially in the frontal region. With this improvement in the form of the human skull, the flint, stone, bone and horn instruments made by the post-glacial inhabitants of Western Europe become more highly finished than those belonging to the previous age, indicating the possession of increasing intellectual power on the part of those who made them.

The Engis skull, of which we have a cast, presented to this College by Sir Charles Lyell, is a well-known example of a human cranium of the early Neolithic [16] or post-glacial period. Huxley, in his description of this

[16] The term Neolithic is used to signify that period in which the stone, bone and horn implements made by man indicate a considerable advance in the arts of life beyond those discovered in the previous Palæolithic epoch. In the Neolithic period the remains of the mammoth, rhinoceros and other prevalent extinct forms of the Palæolithic series had almost, if not completely, disappeared from Western Europe. The deposits in which these Neolithic remains are found consist of river-gravels, cave-floors, peat-bogs, raised beaches, &c. &c.

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skull observes, 'It takes us, at least, to the further side of the biological limit which separates the present geological epoch from that which preceded it,' that is, from the glacial period.[17] The Borris skull probably also belongs to this period, its characters being similar to the Tilbury cranium described by Sir Richard Owen, and of which we have a cast in our Museum. To this list of post-glacial, or it may be of the later glacial period, we may add the Egisheim calvaria, or so much of it as has been preserved. This specimen, of which we have a cast, was discovered in a high river bed near Colmar, with the bones of extinct animals and Mousterian flint weapons (*see chart*). These and various other skulls found in geological formations of the time referred to are all of the same type, and lead us to believe that the inhabitants of Europe in the early Neolithic period consisted of only one race, the descendants of the human beings who inhabited our part of the world during the previous or Palæolithic epoch. They had long (dolichocephalic) skulls, with slightly projecting supra-orbital ridges, well-formed noses, and a fairly developed frontal region as compared with the far more ancient Java, Spy and Neanderthal crania. Their mandibles and the bones of their legs were less simian in character than those of their remote progenitors; they were a small race of beings. We find no metal weapons or instruments with their remains, and we therefore conclude that they were ignorant of the

[17] *Man's Place in Nature*, by Professor Huxley, p. 120. For a description of the Borris skull, see S. Laing and Professor Huxley's *Prehistoric Remains of Caithness*.

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use either of bronze or of iron, nor do they seem to have possessed domestic animals, or to have had any knowledge of agriculture.

This race of primitive inhabitants of Western Europe are best described as the Iberians, and we may conveniently employ this term so long as it is understood to designate the Africo-European stock, who were, so far as we know, the sole human inhabitants of Western Europe after the termination of the glacial epoch.

As we pass from the early to the mid-Neolithic epoch, we come upon the remains of a race of men who, as regards their physical character and state of civilisation, essentially differ from the people above referred to. The stone implements found with their skeletons are beautifully formed, many of them being highly polished and having sharp cutting edges. A few of the purest bronze axe-heads have been discovered with these remains, and also the bones of domestic animals belonging to species indigenous to Asia, but foreign to the Palæolithic fauna of Europe. Lastly, we have evidence that these people were acquainted with agriculture, and with the manufacture of sun-dried pottery. They paid great respect to their dead chiefs, burying their bodies in natural caves, or in tombs formed of huge flagstones placed edgeways side by side, with similar stones laid on the upright ones to form the roof of the building. These structures, the well-known long dolmens, have been found, built on precisely the same plan, in Ireland, England, the greater part of Europe, the West of Asia, India, Arabia and Northern

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Africa. The construction of these dolmens, wherever met with, is so similar in style that we conclude they were the work of one race, or at least of one special confederacy of races. They were not only sepulchres for the dead, but many of them also contained an altar, a place of mourning and of offering, where intercession was made to the spirits of departed chiefs by their relations and tribesmen. The Rodmarton long dolmen or temple tomb (near Cirencester) affords us a good example of one of these structures; it is 180 feet in length and 70 feet broad. We have in our Museum a fine human skull which was found in this dolmen, with some well-polished stone implements. If we compare this skull with that of the Java or the Neanderthal group of men, or with the skulls of the early Neolithic human inhabitants of Western Europe, we are struck by the marked difference that exists between them and the Rodmarton skull. Dr. Thurnam's unique collection of crania may be seen in the Anatomical Museum, Cambridge; these crania for the most part were unearthed by himself from various English long dolmens and barrows, and they resemble in form, although they are of a higher type than, the skulls found in the caves of Cro-Magnon and Mentone; they are identical in character with skulls found in the long dolmens of France and other countries of Europe. The cranial index, capacity, and other features of the bones of these skulls lead us to assign them all to one and the same race, of which the Cro-Magnon are probably some of the earliest specimens as yet discovered in Western Europe (*see chart*). The three Cro-Magnon and three Men-

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tone skeletons were those of people some 6 feet 4 inches and upwards in stature, so that a race of giants in far distant times was no myth. Their cranial capacity was above that of the average Europeans of the present day; from their physical conformation and from the remains of the animals found buried with them, which are of Asiatic species, and from other evidence, we are led to the conclusion that the Cro-Magnon race represent the advance guard of the proto-Aryan human family, of which the Rodmarton [18] and many other long dolmen skulls show a more advanced type. These people in far distant ages migrated from the East into Western Europe, and from thence spread into our islands; southwards they passed into India, Persia and Arabia, Asia Minor and Northern Africa. Over this vast area and far away in Eastern Asia we find their remains, with flint and stone implements of the early Neolithic type, buried in long dolmens or barrows. The roots of many of the words used by this ancient people exist in most of the languages now spoken in Europe; their religious sentiments, myths, and above all, their racial, mental and physical characters, as portrayed in the Rig-Veda, and on the ancient monuments of Egypt, are pronounced features in the existing Teutonic and Anglo-Saxon people. From the form of the crania found in many of these long dolmens we know that this tall, fair, handsome, long-skulled race intermarried with the pre-existing short, dark Iberian

[18] In the *History of Ancient Wiltshire*, by Sir H. C. Hoare, vol. i. plate xvii. p. 164, there is an account of a skull found in a long barrow near Stonehenge, which is now to be seen in the Anatomical Museum at Cambridge (No. 180A), of which I have a photograph.

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inhabitants of Europe. The fair, tall race probably did not at any time, unless in the North of Europe, form a large proportion of the population; they were a dominating, fighting and priestly caste who compelled the primitive, small, dark (Iberian) inhabitants of Western Europe to work as their slaves.

During the Neolithic era, while the descendants of the proto-Aryan stock were slowly feeling their way from the East along the valley of the Danube into Europe, a very different race were passing from Northern Asia into the Baltic Provinces. These people formed settlements on the islands of Denmark, and westward as far as the North of Ireland. They were the first of the broad-skulled races of the human family who had entered Europe. Their skulls were brachycephalic in form, with broad faces and noses, the latter being deeply concave at the base. Their remains are found in the islands of Denmark, especially that of Möen, also in Yorkshire, Derbyshire, Staffordshire,[19] and in Cos. Antrim and Tyrone,[20] in which localities their descendants may still be recognised by their physical characters. They buried their dead and did not practise cremation, as did the Mongolians of the bronze age in Europe. These people belonged to the stone age of Europe, and by comparing their skulls with those of the Rodmarton or Cro-Magnon crania we see the great difference in form of the prehistoric, long, and the broad-headed races of men.

[19] *Crania Britannica*, Tables on, pp. 241-44.

[20] Professor A. C. Haddon. See Studies in Irish Craniology, *Proceedings of Royal Irish Academy*, vol. iv. p. 577.

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Until the close, therefore, of the Neolithic epoch there were three pure races who formed the sole human inhabitants of Europe, so far as we can judge from their skulls and other remains, with the exception of those who were the outcome of the intermarriage of these three races of people with one another.

Passing from the Neolithic to the succeeding bronze age, we believe that Europe was overrun by a small, broad-skulled people having characteristic Mongoloid features. These people were probably, in their Asiatic home, originally derived from the same stock as the tall, fair, broad-skulled North Mongolian race above referred to. But the southern Mongoloid people of the bronze age in Europe were a small race of men with dark hair and eyes. These were the early lake-dwellers of Switzerland and other parts of Europe. Professor A. C. Haddon is disposed to think that, before their arrival in our islands, these people had become a mixed stock through intermarriage with the Iberian, or Mediterranean race. (In the dolmen at Meudon we find the remains of a man of the broad- and a woman of the long-skulled race placed side by side.) They were traders in bronze, and probably, as Professor G. Mortillet and other authorities hold, gradually replaced stone, horn, and bone with bronze instruments and weapons, effecting in this way a great revolution in the social and industrial habits of the pre-existing inhabitants of Western Europe. In these far distant times deep mining operations were out of the question. Superficial ores of copper were abundant in most parts of Europe and in Asia, but alluvial tin was extremely

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scarce, and it is still only found in large quantities in South-Eastern Asia. Cornwall, the Scilly Isles, the South of Ireland, and some few other places on our Continent also contained superficial ores of tin. It seems probable that the Mongolians inhabiting the highlands of South-Eastern Tibet, long before the commencement of the bronze age in Europe, spread into Burma, the Malay Peninsula, and Cochin China, and there acquired the art of mixing copper and tin in such proportions as to form bronze, the weapons and instruments which they manufactured of this metal being a ready and profitable source of barter in Europe. These people, without doubt, made bronze weapons both in the South of England and of Ireland, for clay moulds have been found there in which weapons of the early bronze period in Europe were cast.

Together with the broad skulls and other remains of these people we find in the *débris* of the lake-dwellings numerous ornaments of jade, nephrite and chloromelanite, minerals found in large quantities in South-Eastern Asia, but not in Europe; and lastly, vases, on which are depicted people in Oriental costume, and instruments used only by the south-eastern Tibetans have been discovered in connection with the remains of the lake-dwellers. It is almost unnecessary to remark that, although many millions of Hindus have in successive periods occupied the greater part of Bengal, it would be impossible to discover their bones in the soil, for the simple reason that they have either burnt the bodies of their dead, or else cast them into one of the sacred river of India. And so it is with

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the skeletons of these southern Mongoloid people of the bronze age in Europe; as a rule their bodies were cremated after death, and numerous cinerary urns containing their remains are found scattered over the Wiltshire and other ranges of hills in the South of England. Some few of their skeletons, however, have been found in the round barrows which are so numerous, especially in the South of England, of Ireland, and throughout various other parts of Europe, and in Asia. With these remains and cinerary urns very many bronze instruments have been met with, indicating, like the stone implements of the Palæolithic period, different stages of excellence in workmanship.[21] The size of the handles of the bronze knives and other weapons, as well as the bangles, prove that the people who used them were a small race of men and women, we believe best represented in Europe by the prehistoric short inhabitants of Auvergne.[22]

One of the finest skulls in our Museum was taken from a round barrow at Codford, Wilts; and although this skull must be at least 5,000 years old, it still seems as if it were full of life and fun (*see our chart*), characteristic features of the race to which it belonged. The form of this brachycephalic skull, together with its nasal bones and orbits, are clearly Mongoloid in character, and are well known to those of us who have lived in India as representing the Ghurkhas and

[21] *The Ancient Bronze Implements of Great Britain*, by Sir John Evans.

[22] *Formation de la Nation Française, par* G. De Mortillet, Professor à l'Ecole d'Anthropologie, pp. 257, 269–270. See also *The Dolmens of Ireland*, by A. C. Borlase, pp. 1012–14.

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Burmese of the present day. A lazy, bright, rollicking people, intensely superstitious and home-loving—'The Irish of the East,' as they have been aptly called. In the course of many centuries the southern Mongolian people of western Europe have unquestionably become absorbed into the pre-existing Ibero-Aryan population, a cross breed has resulted, and from this stock the ancient British people of our islands were derived. Their skulls are mesocephalic (a combination of the long and broad skull), and are amply represented in our Museum, the cephalic indices being about seventy-eight.[23] Subsequent to the bronze age the ancient Britons were well-nigh exterminated in England by Teutonic races who invaded our country from the North of Europe, the Anglo-Saxons taking the place of the pre-existing ancient British population of England and Scotland. Nevertheless, in some districts of England, such as North Bedfordshire, a number of the descendants of the ancient British stock continue to flourish up to the present day, as also in the greater part of South Wales, much of Cornwall, and the South and West of Ireland, the upper classes in Ireland being clearly derived from the ancient Aryan stock who passed from Gallia into that country during the Neolithic period. On the left lower line of our chart a characteristic head and face of one of the descendants of the ancient British race may be seen, and on the right-hand corner of the chart that of a typical Anglo-Saxon.

Passing from prehistoric to the present time, we

[23] The Mongolian cephalic index being from eighty upwards, and that of the Ibero-Aryan seventy-five and below that figure.

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have come to possess the measurements of the heads of some twenty-five millions of the existing inhabitants of Europe.[24] From these measurements we learn that a large proportion of the people now dwelling in the countries bordering on the Mediterranean Sea are a short, brunette, long-skulled race, descended, we believe, from those who, from the form of their skulls and other physical characters, occupied that part of Europe and the North of Africa in far distant ages, the Iberian race.

Scandinavia and North Germany are inhabited by a tall, fair, long-skulled people derived from the proto-Aryan races who settled in that part of our continent in the Neolithic epoch. A vast triangle, having its base in Eastern Russia and its apex on the Atlantic in South-western France, is inhabited by the broad-skulled people derived from Mongoloid or Turanian ancestors. We do not for a moment affirm that these races, as such, have remained pure, far from it; but the results of the measurements of the heads of a great number of the existing inhabitants of Europe point to the conclusions above indicated; and this idea is confirmed by the cranial indices of the splendid collection of crania which occupy so large a space in the Museum of this college—a collection which was commenced by John Hunter, and upon which during the past century a great amount of time and labour has been spent in describing and classifying the skulls which it contains.[25]

[24] *The Races of Europe*, by W. Z. Ripley, p. 34.

[25] We have about 4,000 skulls in our Museum, arranged according to the countries of which they are presumably native. All these specimens

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Our collection has been added to and kept well up to date by Professor C. Stewart, and might, I think, with advantage to science, be utilised in an effort to solve the debatable question of the connection between the Neanderthal group of men and the post-glacial inhabitants of Western Europe.

The characteristic physical type of Palæolithic man may be still recognised among the inhabitants of Western Europe, although their skulls have grown more capacious, especially in the frontal region. This change in the form of the cranium marks a corresponding advance in the capacity and organisation of the brain, and of the intellectual ability of man; it is in truth evidence of his inherent power to overcome the demand made on his mental capacity in order to cope successfully with his ever-increasing struggle for existence, consequent on the growth in number of his fellow creatures, and the more complicated social conditions of his surroundings. Doubtless the form of skull of a large proportion of the inhabitants of our island indicates a cross breed formed by the intermarriage of the long- and broad-skulled families of man who in distant ages met and intermarried in Western Europe, thereby improving the stock of their descendants. Races of men such as the natives of Australia who have remained in an unchanged environment, and without intermarriage with other people, have made but little progress in their intellectual capacity, the form of their skulls continuing

have been accurately measured, and described in our catalogue either by Sir W. Flower or by Mr. L. McAra under Professor C. Stewart's supervision.

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of the same type as those possessed by the Palæolithic inhabitants of Europe.

The same causes to which we have referred, acting for long periods of time on people of the same race, have not only led to the hereditary transmission of their physical characters, such as those existing respectively among the northern, central, and southern inhabitants of Europe, but have also developed specialised areas of nerve structure in their brains, by means of which they have come to think, feel and reason alike; thus having an inherent widely diffused individuality. In this way we are able to comprehend the source and the meaning of large bodies of men belonging to the same race being frequently moved to take common action on matters affecting the well-being of their race; they possess, in fact, like innate sentiments, or racial characteristics, although separated from one another by great distances and living under diverse climates and environment. Their emotions and ideals harmonise, because their progenitors existed for many ages under similar external conditions, and consequently developed like specialised nerve-centres, which have been transmitted, together with their physical characters, to their successors, and become crystallised in their laws, and reflected in their conceptions of religion as well as in their social institutions.[26]

In illustration of our meaning, we may refer to those revolting pages of history during which Belgium and

[26] *The Origin and Character of the British People*, by N. C. Macnamara, p. 192. See also the *Westminster Review*, December, 1900, p. 634.

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the Netherlands passed under the dominion of Spain, the Iberian dominating for the time being over a thoroughly Teutonic race. Or we may contrast the existing condition of the Iberian population of South America with the Teutonic Anglo-Saxon inhabitants of the United States, or that of the latter with the negro population of America.

We have a chart here which shows the result of the recent General Election held in this country: the question at issue was one in which the whole of the people of Great Britain were deeply interested. It is remarkable what a large proportion of the inhabitants of England and of Scotland, mainly of Anglo-Saxon origin, voted together on this subject; whereas a contrary opinion regarding this same question was held by the greater proportion of the people of Ireland, and to a large extent by the Welsh, most of whom are derived from Ibero-Mongolian ancestors. It is difficult to account for the diversity in the sentiments of the people above referred to, unless we consider it due to their racial mental qualities.[27] Environment has doubtless played an important part in the evolution of these people, but their inherited racial character has had more to do with the position which the Anglo-Saxon race has gained in the world than the mineral wealth,

[27] This idea is confirmed by the result of the elections that have lately taken place in Canada and in the United States of America. The younger branches of our Anglo-Saxon race, forming by far the larger proportion of the inhabitants of these vast and flourishing dominions, had to solve a similar question to that placed before the people of Great Britain, and they have responded by a vast majority to this call, on precisely the same lines as those followed by Englishmen, moved, we believe, by common racial inherent sentiments.

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climate, or protection afforded us by our sea-girt coast.

The environment under which even a few generations of men exist would seem capable of influencing the structure of their central nervous system, as illustrated by comparing the mental qualities of our rural and urban population. The conditions under which the city-bred child and man live engender in the course of a few generations an unstable state of nerve structure, resulting in an excitable character, which, if carried beyond a certain point, leads to unsoundness of mind, and may account for the increasing number of lunatics in this and the other large cities of Europe. General Sir Redvers Buller again, in speaking of the soldiers under his command in South Africa, refers to the fact that our city-born men have imperfect sight compared with men reared in the open plains of the Transvaal, thus affording us another example of the effects of environment on the race.[28] These are a few of the many interesting and important subjects which arise in connection with the study of anthropology, including craniology; and the contents of our Museum and Library offer unrivalled opportunities to the

[28] Sir Redvers Buller in one of his speeches is reported to have stated that, 'In the first instance many of our men are city-born, and England is not a very large country. We went out to a region where the principal number of our enemies were born in a very open country, a very large country, and it is not untrue to say that practically the vision, the ordinary sight, of our enemy was two miles at least further than the average sight of the English who were fighting against them. That is a matter of actual fact. An ordinary Dutchman or African can see a man coming towards him two miles before the man approaching can detect him.'

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student seeking for knowledge in these branches of science.

In conclusion, as already stated, much of Hunter's reputation was founded on the result of his labours in those branches of science which tend to elucidate man's nature; and during the past century a succession of English surgeons have carried on the work commenced by our great master, enriching our Museum and endeavouring to make this College not only an examining and licensing body, but what it certainly should be, an Imperial institution for the cultivation and diffusion of those departments of knowledge which bear on comparative anatomy, physiology, or surgery. The ideas entertained by John Hunter's immediate successors on this subject were ably stated by Sir William Lawrence, in his Lectures already referred to, when he observes that 'our own individual credit, and the dignity, honour, and reputation of our body, which we are bound to maintain, demand that surgeons should not be behind any other class of the community in the possession either of the cultivation of those branches of knowledge which are directly connected with surgery, or in any of the collateral pursuits less immediately attached to it.' Sir William continues: 'It is only in reference to such views and objects that the Hunterian collection could have been accepted or can be of any use to this College.'[29] Hunter would, had he still been with us, have thrown all his indomitable energies into the

[29] *Lectures on Physiology, Zoology, and the Natural History of Man*, delivered at the Royal College of Surgeons by W. Lawrence, F.R.S., 1819, p. 497.

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successful working of such an institution, and amidst the turmoil, strife and competition going on around him, would, as we see him in this picture, have been engaged in the earnest, accurate, patient study of nature. It remains for our younger members to emulate the example set them by John Hunter, and by such service secure for themselves lasting satisfaction and add to the real dignity and utility of this College and of their profession.

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